Observations on the Mountain Pygmy Possum, *Burramys parvus*, on Mt Higginbotham, Victoria.

By I. M. Mansergh, [A] and N. G. Walsh, [B]

Abstract

Results from a trapping program on the Mountain Pygmy Possum *(Burramys parvus)* conducted on the eastern and western slopes of Mt Higginbotham, Victoria, during February — April 1982, are presented and compared with results of a previous study in the same area (Gullan and Norris 1981). In the previous study, 51 *Burramys* were encountered on 96 occasions (over 4800 trapnights) whilst in the present study 50 *Burramys* were encountered on 73 occasions (1725 trapnights) including 7 females which had been tagged 23 months or more previously. During the survey period, some female *Burramys* appeared to be relatively sedentary and results suggest that there may be some sexual segregation within the population. *Burramys* was encountered in the habitat described in the previous study (closed *Podocarpus* shrubland and low woodland-open shrubland) and also in two floristic communities not previously recognised as its habitat, i.e. closed tussock grassland/sedgeland and closed shrubland. The ticks, *Ixodes fecialis* and *I. (?) tasmani* were collected from *Burramys*.

Introduction

The Mountain Pygmy possum *(Burramys parvus)* is the only Australian mammal restricted to the alpine and subalpine region and although first described from fossil remains from Wombeyan Caves, NSW (Broom 1896) it was not until 1966 that the first live animal was taken at the University Ski Club (USC) in the Mt Hotham Alpine Resort Area (MHARA) (Fig. 1). Subsequent discoveries were made within the MHARA, at two localities on the Bogong High Plains (Gullan and Norris 1981, Dixon 1971) and within the Kosciusko National Park (Calaby *et al* 1971). Recently *Burramys* has been discovered at Basalt Temple and south of Mt Niggerhead. The species is considered vulnerable throughout its known range (Ahern 1982).

Between May 1979 and March 1980 Gullan and Norris (1981) conducted an investigation into the occurrence of *Burramys* in the MHARA, and encountered 51 individuals on 96 occasions in over 4800 trapnights. Their results may be summarised: Within the MHARA 91 sites (established at intersections of 10" x 10" grid) were trapped (990 trapnights) and a single female captured; 3 females (4 recaptures) were taken at selected sites (787 trapnights) whilst 5 males and 10 females (10 recaptures) were taken in the USC (about 150 trapnights). Furthermore, their study method involved a mark-recapture program on a 7.5 ha grid (traps at 25m intervals) carried out on a basalt scree on the western slope of Mt Higginbotham (altitude 1700-1780m). Thirty two *Burramys* were encountered on 63 occasions (2964 trapnights). Floristic and structural data were taken at each 10" intersection within the MHARA and within the grid on the western slope at Mt Higginbotham. Eight floristic communities were identified in the MHARA, and two of these, low woodland and low open woodland, occurred on the western grid a further five sub-communities

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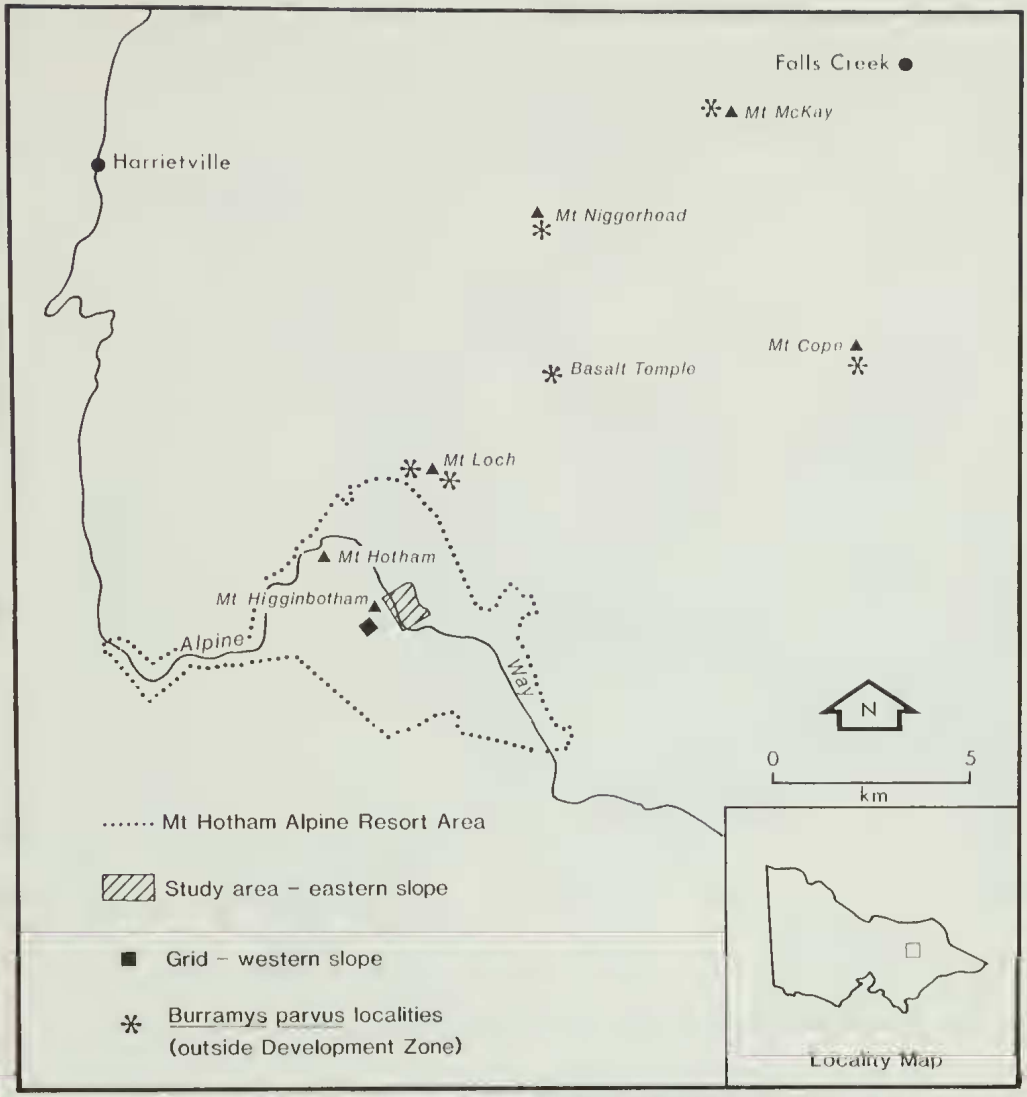

Fig. 1. The distribution of *Burramys parvus* in Victoria showing study areas in the eastern and western slopes of Mt. Higginbotham.

(including *Burramys* habitat) were identified in this area but could not be mapped throughout the MHARA due to the broader scale of sampling in the larger area (Fig. 1). Areas used by female *Burramys* were identified from floristic analysis of the western grid as closed Mountain Plum Pine *(Podocarpus lawrencei)* shrubland and low woodland-open shrubland where these overlaid basalt scree. However, the communities used by males remained unclear as only 3 males were taken on the grid (all in November), and the only other 5 males captured were taken inside the USC.

Proper management of the *Burramys* populations in Victoria and elsewhere is inhibited by lack of knowledge concerning its ecology and biology. As part of a

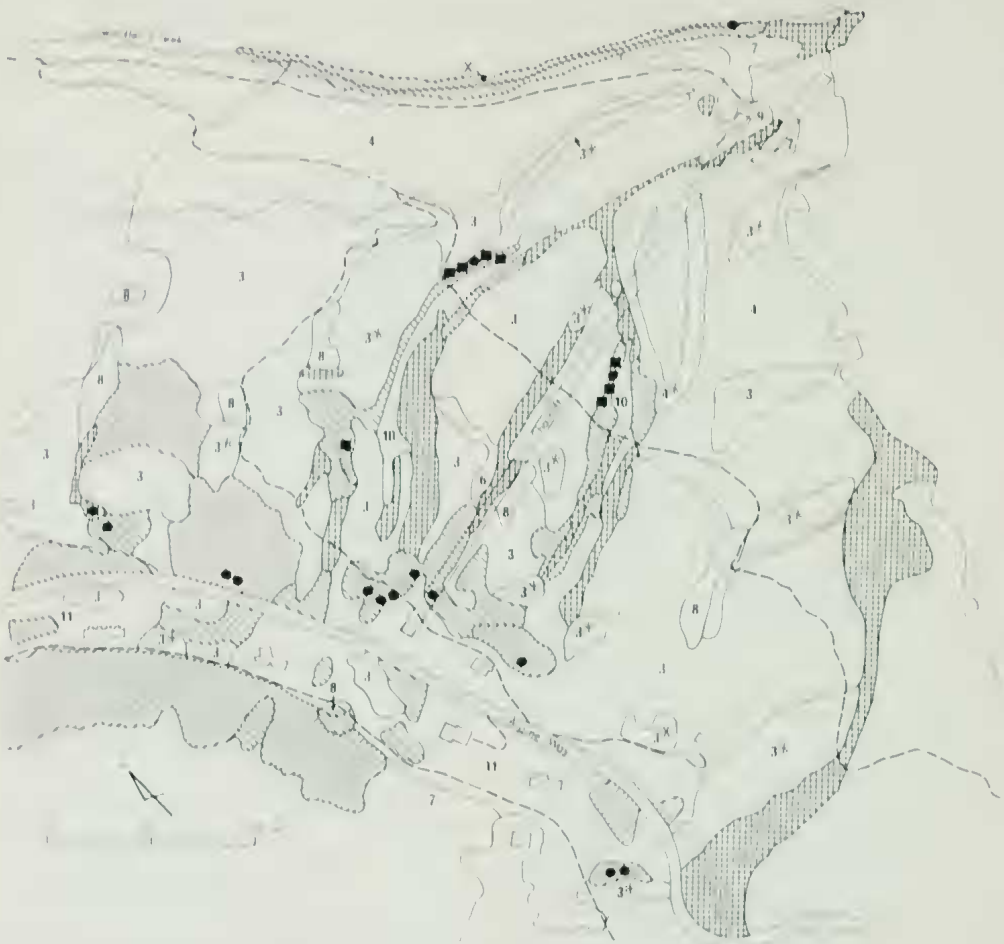

Fig. 2. Floristic communities and *Burramys* capture sites on the eastern slope of Mt. Higginbotham.

Explanatory Notes Fig. 2

- ■ Male *Burramys parvus* capture sites.
- ● Female *Burramys parvus* capture sites.

1. Closed Podocarp shrubland intermittent boulderfield.
2. Low woodland open shrubland (includes closed shrubland variant)
3. *Eucalyptus pauciflora* woodland
4. Low open forest
5. Closed tussock grassland sedgeland
6. Wet alpine heathland
7. Low grassy shrubland
8. Rocky herbfield low shrubland.
9. Dry grassland herbfield
10. Unvegetated basalt scree
11. Disturbed woodland

N. Mixture of communities 2, 2 var.,

* Canopy removed

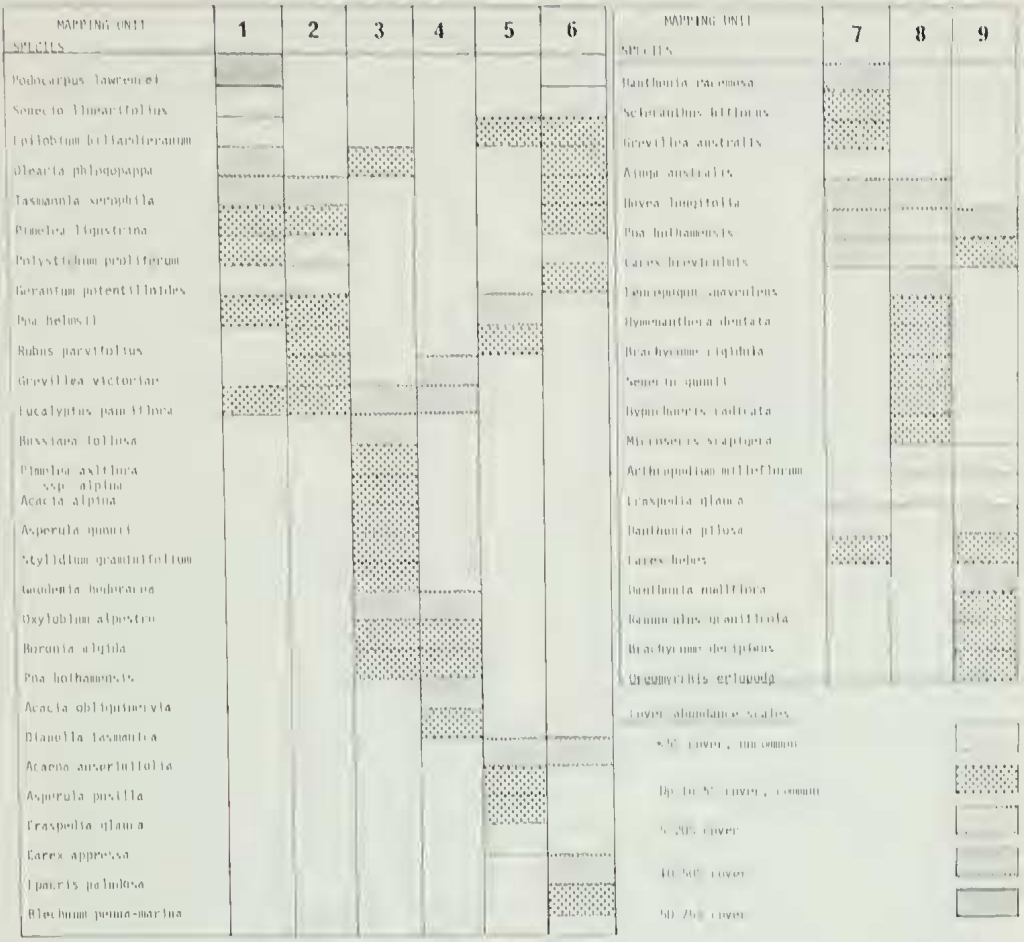

Fig. 3. Floristic composition of vegetation communities on eastern slope of Mt Higginbotham, Victoria (distribution of these communities is given in Fig. 2).

Explanatory notes Fig. 3.
1. Closed Podocarp shrubland/intermittent boulder field
2. Low woodland/open shrubland
3. *Eucalyptus pauciflora* woodland.
4. Low open forest.
5. Closed tussock grassland/sedgeland.
6. Wet alpine heathland.
7. Low grassy shrubland.
8. Rocky herbfield/low shrubland.
9. Dry grassland/herbfield.

continuing effort to understand more about the species the MHARA was revisited in February and March-April, 1982 to more closely identify habitat utilization, to obtain data on longevity of the species and to obtain more data on the male population.

Study Areas

Mt Higginbotham (1800m) is situated on the Great Dividing Range in north

central Victoria (Fig. 1) and has an underlying bedrock of Ordovician sandstone and siltstone which is overlaid by a Oligocene basalt deposit (LCC 1977). This basalt has eroded leaving a cap on the peak and boulder screes down the eastern and western slopes. The vegetation ranges from alpine herbfield above about 1750m to various subalpine woodlands and shrublands at lower altitudes. In an average year snow accumulates in the area from June until September. Within this area two sampling sites were established, one on the western slope within the grid established by Gullan and Norris (1981) and the second on the eastern side of Mt Higginbotham extending from about 100m above the Alpine Way to Swindler Creek (Fig. 2). The vegetation of the latter area was identified by Gullan and Norris (1981) from analysis of data collected in the MHARA as low woodland and low open woodland. However, the extent of *Burramys* habitat remained unknown.

Methods

(a) Western slope grid.

At this site a trapping program was conducted between 1-6 February and 31 March-11 April, 1982 in which the methodology followed that used by Gullan and Norris (1981) i.e. one Elliot type A aluminium trap (32.5 x 10 x 9.5 cm) baited with walnut was placed at each site. Sites were revisited daily and soiled traps were replaced with others cleaned in hot water. Captured animals were examined and the sex, breeding condition (Dunnpel and Calaby 1972), weight and presence of ectoparasites were recorded and individual *Burramys* were marked with numbered Monel metal fingerling ear tags.

(b) Eastern slope.

This area was visited between 1-11 April, 1982 and floristic communities were identified according to the criteria and definitions established by Gullan and Norris (1981) i.e. presence/absence of plant species in a particular community. The extent of each identified floristic community was recorded on a coloured aerial photograph of the area. In this area trapping was conducted to determine the preferred habitat selected by *Burramys*, as detailed by Gullan and Norris (1981), and also to check that other areas not previously regarded as *Burramys* habitat were in fact correctly assessed. The methodology followed that adopted within the Western slope grid. However, traps were left at selected sites for two nights along lines where they were placed at 5-25m intervals.

Results

Twenty-three (of 28) known *Burramys* capture sites on the western slope of Mt Higginbotham were revisited. One hundred and seventy-one trapnights were undertaken at 39 adjacent sites in February and 254 in March-April at 36 adjacent sites, and 30 individual *Burramys* were encountered on 50 occasions. Trapping success for *Burramys* in each period was 17.5% and 7.8% respectively (Table 1). On the eastern slope 1300 trapnights were undertaken and 19 *Burramys* encountered on 23 occasions with a trapping success for *Burramys* of 1.7% (Table 2). *Burramys* was captured at nine of the 20 sites visited. Nine floristic communities were identified on the eastern slopes and a further two categories were recognised, i.e. unvegetated boulder scree and disturbed woodland (interspersed with building sites) (Figs. 2 and 3). Results are summarised in Tables 1-3 and Figures 2 and 3. Communities described as closed *Podocarpus* shrubland with intermittent scree and low woodland/open shrubland are equivalent to *Burramys* habitat as described by Gullan and Norris (1981).

The sex ratios (male:female) of the captured *Burramys* population on the western grid were 1:14 in February, whilst no males were taken there in March-April, however, on the eastern

Table 1. Small mammal captures on the western slope of Mt Higginbotham, 1979–82 (Captures/100 trapnights given in parenthesis).

	Burramys parvus	*Rattus fuscipes*	*Antechinus swainsonii*	Total
+ November	22 (5.6)	39 (10)	-	61 (15.6)
+ December	78 (17.9)	10 (12.8)	-	24 (30.7)
February	30 (17.5)	37 (21.6)	19 (11.1)	86 (50.2)
++ March	23 (9.8)	16 (6.8)	19 (8.6)	58 (24.8)
March-April	20 (7.9)	88 (34.6)	18 (7.1)	126 (49.6)
+ May	-	17 (21.8)	5 (6.4)	22 (28.2)

+ 1979, ++ 1980 from Gullan and Norris (1981) using data from only sites retrapped during the present study.

slope the ratio was 1:1.9. There was a significant difference between the sex ratios of the populations captured at ten *Burramys* sites (the western grid is used as one site) during March-April (L.R.X^2 = 31.85;10d.f.;$p < 0.001$). Using data from all studies and for all capture sites (excluding the USC) in the MHARA, in the period February-April, the sex ratios encountered at different sites remained significant (L.R.X^2 = 39.61: 13d.f.;$p < 0.001$).

In February, whilst no previously tagged males (3) were caught, 6 (of 29) previously-tagged females were encountered and a seventh appeared to have lost an ear tag. Of the six identifiable animals three were taken at site of last capture, one at an adjacent site and two at diagonally adjacent sites (35 m). The maximum direct distance recorded between recaptures (February and March-April) including data of Gullan and Norris (1981) was 75m. (Table 3). The average time between successive recaptures for all trapping periods on the grid was 2.7 ± 0.38 days with 40% of captured animals encountered on two or more occasions.

On the eastern slopes *Burramys* was recorded at 9 (of 19) sample sites and in 4 (of 9) floristic communities sampled (Figs. 2 and 3) these being closed *Podocarpus* shrubland with intermittent scree, low woodland/open shrubland, closed tussock grassland and a closed shrubland variant of low open woodland (Fig. 2). Only one animal was captured off basalt scree (Swindler Creek). Males were caught at 3 (of 9) *Burramys* capture sites and each site was in low woodland/open shrubland located mid-or upper mid-slope (Fig. 2).

Ticks were collected and identified as *Ixodes fecialis* (nymphs and larvae) and *I(?) tasmani* (adults and nymphs).

Discussion

Gullan and Norris (1981) found that during November-March female *Burramys* were restricted to closed *Podocarpus* shrubland with intermittent scree and low woodland/open shrubland and during the present study 91% of *Burramys* captures on the eastern slopes of Mt Higginbotham were made in these habitats (Table 2). However, *Burramys* was also found in closed tussock

Table 2. Trapping results in various floristic communities on eastern slope of Mt Higginbotham, 1-11 April, 1982 (Captures/100 traphights given in parenthesis).

Vegetation Community*	Traphights (traphights)	Captures				
		Burramys parvus	*Mastacomys fuscus*	*Rattus fuscipes*	*Antechinus swainsonii*	*Mus musculus*
1	273	5 (1.8)	–	62 (22.7)	14 (5.1)	2 (0.7)
2	301	8 8 (5.3)	–	61 (20.3)	15 (5.0)	13 (4.3)
2 Variant: Closed Shrubland	35	1 (1.3)	–	5 (14.3)	1 (2.8)	–
3	450	–	–	98 (21.8)	26 (5.7)	5 (1.1)
4	90	–	–	3 (3.3)	2 (2.2)	–
5	42	1 (2.4)	–	6 (14.2)	1 (2.4)	1 (2.4)
6	43	–	–	6 (17.1)	4 (9.3)	–
7	Nil	–	–	–	–	–
8	36		1 (2.7)	14 (38.9)	1 (2.7)	–
9	Nil	–	–	–	–	–
10 Unvegetated Basalt Scree.	30	–	–	1 (3.3)	–	–
Total	300	23 (1.8)	1 (0.07)	256 (19.6)	64 (4.9)	21 (1.6)

Total (%)
83 (22.7)
105 (28.7)
9 (2.5)
129 (35.3)
5 (1.4)
9 (2.5)
8 (2.2)
–
16 (4.4)
–
1 (0.7)
365 (100)

* See Figure 3 for floristic composition of communities

grassland and a closed shrubland variant of low open woodland in this area (Fig. 2., Table 2). On the western slope grid the Bush Rat *(Rattus fuscipes)* is common and the Dusky Antechinus *(Antechinus swainsonii)* relatively less abundant in *Burramys* habitat (Table 1) and a similar situation exists on the eastern slopes. However, in the latter area where there has been more disturbance through building and ski slope development the introduced House Mouse *(Mus musculus)* is also present (Table 2).

Table 3. Range length between successive recaptures and maximum direct distance moved by Burramys parvus on the western slope of Mt. Higginbotham 1979-82.

	Range Length (m) between successive recaptures			Maximum direct distance (m).		
Recapture	n	$\bar{x}$	S.E.	n	$\bar{x}$	S.E.
1	22	36.8	± 6.6	8	44.8	± 7.6
2	14	12.5	± 3.6	5	33.2	± 11.4
3	9	22.3	± 7.8	3	72.6	± 19.9
4	6	33.8	± 4.9	3	55.3	± 11.7
5	3	35.0	±17.9	1	56	-
6	2	30.0	± 5.0	1	56	-
7	1	0	-	1	56	-

Some female *Burramys* lived through at least three breeding seasons as 7 of the 29 females tagged by Gullan and Norris (1981) during 1979-80 were recaptured in February 1982 and at least 5 of these recaptures were initially tagged as breeding adults. Three of these recaptures were made at point of last capture and the mean distance from point of last capture was 16m. These data suggest that at least some female *Burramys* may be relatively sedentary during the periods of surveys (i.e. November-April).

Disparate ratios between the sexes of *Burramys* captured at different sites have been noted by Gullan and Norris (1981) in the MHARA (i.e. 0:1, 3:60; 0:7 and 5:20) and at Kosciusko National Park (J. Caughley, personal communication). Male trap shyness was suggested as a possible cause by Gullan and Norris (1981), however, Caughley (personal communication) has found that males have a higher propensity for recapture than females. Although results to date may be an artefact of collection, the variation between the sex ratios of captured *Burramys* at different sites is statistically significant. Some form of sexual segregation within the *Burramys* population on Mt Higginbotham during February-April is suggested. Explanation of this segregation, which is not absolute, is difficult as Dimpel and Calaby (1971) have shown that captive *Burramys* show minimal aggression between the sexes. It has been shown that lactating female long-tailed pygmy possums *(Cercartetus caudatus)* nest alone (Dwyer 1977), however, even if this were the case with *Burramys* it does not fully explain the present results as suckling by the young ceases around late January (Dimpel and Calaby 1972). This aspect of the social organization of *Burramys* warrants further research as it has important implications for proper management of the species.

The *Burramys* captured at Swindler Creek (altitude 1430m) is the lowest altitudinal record of the species in Victoria although an animal has been taken at an altitude of 1373m in the Kosciusko National Park (Dimpel and Calaby 1972). It is also notable that Swindler Creek is mid-way between the known populations on the eastern slope of Mt

Higginbotham and Spargo Hut (Figs 1 and 2). If these populations are interconnected *Burramys* must move through floristic communities that, at present, are not regarded as utilized habitat. Given the potentially conflicting land uses (e.g. development for recreational skiing) within the MHARA and also in the Mt Kosciusko National Park (Gall 1976) more research into the habitat requirements, the biology and population dynamics of *Burramys* is required. Furthermore, this research should be oriented toward developing a management plan for the conservation of this vulnerable species.

Conservation

Gullan and Norris (1981) concluded that the Mount Higginbotham area was significant at the highest level for the conservation of *Burramys*. This conclusion was supported by a systematic survey of East Gippsland that identified sites of zoological significance (Norris and Mansergh 1981). One (of 11) recommendation and Gullan and Norris (1981) was for a reserve that encompassed the undeveloped western slopes of Mount Higginbotham as this area contained the highest population density of *Burramys* yet recorded. Subsequent research in Kosciusko National Park and Victoria has produced no evidence to contradict this assessment (Caughley pers. comm., Mansergh 1983). In Victoria, 26 standardised trapsites were examined and compared to 3 reference sites on the western slope of Mount Higginbotham during December 1982 and February 1983 (over 5,000 trapnights). During each period over 80% of the breeding females were encountered on the reference sites, however, only 20% of the effort was expended at these sites (Mansergh 1983).

Adequate conservation of *Burramys* at Mount Higginbotham can be viewed at three levels, all of which are important. Firstly, the protection of the population on the western slope within a reserve, secondly implementation of a management plan for *Burramys* in areas where conservation is not the primary objective (the program of research mentioned above should provide data for the evaluation of the most appropriate management strategies) and thirdly a program that educates visitors as to the ecological significance and sensitivity of the area (e.g. displays, posters, etc).

Acknowledgments

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Overwintering by *Calomela juncta* Lea (Chrysomelidae) with *Melanterius vulgivagus* Lea (Curculionidae) at Brisbane, Queensland

By T. J. Hawkeswood*

Many groups of beetles undergo a diapause or period of quiescence, which is interpreted by biologists as an adaptation for survival in areas with markedly fluctuating environmental conditions. Beetles may undergo diapause when climatic conditions influence their endocrine systems, which in turn inhibit their development at a particular stage of the life cycle. With diapause proper, the further development of the beetle does not progress until similar environmental conditions act upon the insect's endocrine system to break the diapause. Diapause is different from simple quiescence where the development or activity of the insect merely ceases during adverse conditions such as during cold weather in winter, and resumes again once the favourable conditions return. The term overwintering may be loosely applied to either condition.

On 27 July 1982, I was examining trees of *Eucalyptus intermedia* R. T. Baker (Myrtaceae) near the Mt. Gravatt C.A.E., Brisbane, south east Queensland, for bark insects. I discovered a wound in the bark of one tree about 1.4 m above ground, probably an exit hole of a previously emerged Lepidopteran. Closer examination showed that a single green chrysomelid beetle, *Calomela juncta* Lea (Chrysomelidae: Chrysomelinae) and a group of eight weevils, *Melanterius vulgivagus* Lea (Curculionidae), were clustered close together in an abandoned chamber probably belonging previously to a boring moth larva. Further examination of the same tree produced a smaller group of five weevils, and another of six weevils, tightly clustered together, about 5–8 mm below the outer level of the bark layer. No further *C. juncta* were found, although I did not search extensively on nearby trees of the same *Eucalyptus* species. All beetles were collected for identification and reference purposes, and all became active after disturbance in warmer temperatures (c. 23–25°C) in the laboratory, which suggests that beetles were not undergoing a proper diapause.

Overwintering in some other Australian chrysomelids is known, although has not been recorded previously in *Calomela*. Carne (1966), studying the biology of the *Eucalyptus*-defoliating chrysomelid, *Paropsis atomaria* Olivier, in Canberra, observed that the late-emerging adults of a second generation enter a form of diapause before which they feed vigorously for several weeks, store large quantities of fat and remain sexually immature, then overwinter under bark, or in loose leaf litter. At Armidale N.S.W., I have observed adults of *Paropsis sexpustulata* Marsham overwintering, often in large numbers under loose bark of *Eucalyptus blakelyi* Maiden and *E. pauciflora* Sieb. ex Spreng. (Myrtaceae), in association with stink bugs (Hemiptera) and small numbers of other beetles (Elateridae).

Little has been recorded on the biology of *Calomela*, apart from the knowledge that the adults and larvae feed on the fresh leaves of various *Acacia* species (Mimosaceae),

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